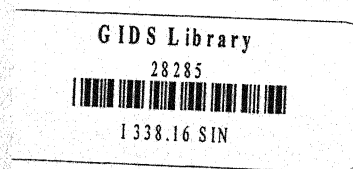


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Potential of Diversification Towards High Value Crops in Uttar Pradesh

REPORT BY

Ajit Kumar Singh



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**POTENTIAL OF DIVERSIFICATION TOWARDS
HIGH VALUE CROPS IN UTTAR PRADESH**

Draft Report



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In Collaboration with

**NATIONAL CENTRE FOR AGRICULTURAL
ECONOMICS AND POLICY RESEARCH
NEW DELHI**

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PREFACE

Diversification of agriculture towards high value crops like fruits, vegetables, flowers and spices is an important part of the strategy for raising agricultural incomes and employment levels. At the same time the process of diversification is expected to have a favourable impact on equity and environment. Liberalization of agricultural trade has given a further boost to the process of crop diversification in India. It is in this context that the present study has been undertaken. It seeks to examine the potential of diversification towards high value crops in the state of Uttar Pradesh. The study is based upon a primary survey of 180 farmers specializing in the horticultural crops from Nainital, Jaunpur and Jhansi districts of Uttar Pradesh representing different agro-climatic situations.

The study has been undertaken in collaboration with National Centre for Agricultural Economics and Policy Research, New Delhi. I would like to thank Dr. T. Haque and Dr. Gordhan Singh of the National Centre for their kind support in undertaking this study. I would also like to thank the project staff sarvashree S.K. Trivedi, Lav Kush Sharma, R.P. Rai and K.S. Deoli, who undertook the onerous

task of conducting the field survey and tabulating data with all sincerity. Shri Manoharan K deserves praise for computer processing of the report. Finally, I express my thanks to the Director and the Administrative, Research and Library staff of our Institute for providing all necessary support for the conduct of the study.

January 9, 1998
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POTENTIAL OF DIVERSIFICATION TOWARDS HIGH VALUE CROPS IN UTTAR PRADESH

1.0 OBJECTIVES AND METHODOLOGY

1.1 Introduction : For long Indian agriculture has been basically oriented to subsistence oriented foodgrain cultivation. Government policy motivated by the concerns of national food security also provided strong support to the foodgrain economy. This has led to the sustained growth of foodgrain production in the country and a notable expansion in area under cereals specially wheat and rice. At the same time it is well known that foodgrain cultivation yields relatively lower returns as compared to non-foodgrain crops. Given the small size of the average holding of the Indian farmer strategies which promote diversification of agriculture towards high value crops need to be adopted to raise the income level of the farmers. These crops are also known to be generally more labour intensive and are thus likely to contribute to improvement in the employment situation as well.

In recent years the domestic demand for various horticultural and plantation crops like vegetables, fruits, flowers, tea, coffee, etc. has been rising sharply with increase in income levels. The process of liberalisation and globalisation of the economy has also opened up new opportunities for the export of various agricultural

products. The newly established international trade regime under WTO opens up new vistas for the developing economies like India, which has special comparative advantage in the growing of agricultural crops specially horticultural crops.

The above developments have led to the rapid growth of area and output of crops like vegetables, fruits flowers, etc. in the country in the recent years. Thus, a definite process of diversification is noticeable in the Indian agriculture towards non-foodgrain crops. This process of agricultural diversification has so far been essentially market led and has been geographically uneven and still small considering the overall agricultural economy. The process of crop diversification needs to be supported by government policy in the field of research, extension and development of rural infrastructure for credit, marketing and transport.

The study of the potential and problems of diversification towards high value crops assumes special importance in the above context. The present study focussed upon the state of Uttar Pradesh is an attempt in this direction.

1.2 Objectives of the Study : The specific objectives of the present study are :

- (a) To analyse the trends in area, production and yields of horticultural and other high value crops and examine the potential of diversification towards high value crops in the state of U.P.

- (b) To estimate costs and returns of high value crops in different agro-climatic situations.
- (c) To identify various technological and socio-economic constraints to diversification towards high value crops.
- (d) To examine the impact of horticulture based diversification on equity and ecological sustainability.
- (e) To suggest appropriate policy measures for promotion of diversification towards high value crops which are conducive to economic growth with equity and ecological sustainability.

1.3 Methodology and Study Design : The study is based on both secondary and primary data. The state and district level trends in area, output and yields of horticultural crops have been analysed with the help of secondary data available from government publications and office records. To examine the other objectives of the study pertaining to relative profitability of various crops and their income, employment and equity implications a primary survey was also carried out in 9 villages from 3 selected districts of the state representing different agro-climatic situations. A purposive multi-stage sampling design was adopted for the study.

In the first stage we selected 3 districts each representing a specific agro-climatic situation having a

greater concentration of area under horticultural crops. The 3 selected districts are Nainital representing the hill region, Jaunpur representing the Gangetic plains and Jhansi representing the Central plateau.

In the second stage one block with greater concentration of horticulture crops was selected in Jaunpur and Jhansi district and 3 villages from each of these blocks were selected, which specialized in horticultural crops. In the hill district of Nainital we selected two blocks - Ramgarh representing hilly tract and famous for its apple orchards and Haldwani representing the tarai or the submountainous region. The latter block now falls in the Udham Singh Nagar district which has been created by bifurcating the erstwhile Nainital district. We selected 2 villages from Haldwani block and 1 from Ramgarh block.

Table 1.1 : Population of Sample Villages

District	Block	Village	Total Po- pulation	No. of Hou- seholds
Jaunpur	Dharampur	Chachakpur	337	51
		Dharampur	3129	463
		Lakhanpur	1208	136
Jhansi	Badagaon	Futera	1466	256
		Marie	1466	250
		Sanora	901	61
Nainital	Haldwani	Bamori	1454	317
		Lohariyashall		
		Malla	670	126
	Ramgarh	Bhorakote	1700	300

The demographic details of the selected villages have been given in Table 1.1 and location details in Table 1.2.

Table 1.2 : Distance of Selected Villages from Various Facilities (in Km.)

District/ Village	Block Office	Near- est Town	Bus Sta- tion	Rly. Sta- tion	Pucca Road	Comm- ercial Bank	Regu- lated market
<u>Jaunpur</u>							
Chachakpur	6	5	5	5	1	1	5
Dharampur	6	8	8	8	0	6	8
Lakhanpur	2.5	10	10	10	1	2.5	10
<u>Jhansi</u>							
Futera	27	22	2	22	2	2	2
Marie	15	10	10	10	10	10	10
Sanora	25	21	3	21	3	3	3
<u>Nainital</u>							
Bamori	9	3	3	2	1	1	4
Lohariyashall	2	6	6	6	0	4	9
Malla							
Bhorakote	10	10	4	44	4	4	10

From each selected village a sample of 20 farmers growing horticultural crops from different size categories was drawn for detailed survey. A duly structured schedule was convassed among the selected farmers. Thus our sample for each district consisted of 3 villages and 60 farmers. The total sample covers 180 farmers from 9 villages.

1.4 Analysis and Presentation of Data : The information collected from the farmers was tabulated manually and presented in simple tabular format for purposes of analysis.

The trends in area, output and yield of horticultural crops at the state and district level have been presented in Section 2, while the results of primary survey have been discussed in Sections 3 to 9. Finally, summary of findings and conclusions have been presented in Section 12.

2.0 HORTICULTURAL DEVELOPMENT IN UTTAR PRADESH

2.1 Introduction : With its productive soils, plentiful water resources and good climate Uttar Pradesh presents excellent conditions of agricultural development. A large variety of crops are grown in the state which contributes around 20 per cent of foodgrains, 7 per cent of oilseeds, 44 per cent of sugarcane, 25 per cent of fruits and 30 per cent of vegetables produced in the country.

Nearly 58 per cent of total geographical area in U.P. has been brought under cultivation. Net sown area in the state has stabilized at around 172 lakh ha., out of which 83 lakh ha. are under double cropping giving a cropping intensity of about 150. Presently around 67 per cent of net sown area and 64 per cent of gross sown area is under irrigation. Tubewells constitute the major source of

irrigation accounting for 64 per cent of net irrigated area, followed by canals which account for another 28 per cent of irrigated area.

The major constraint on agricultural development in U.P. is the very small size of holding, which has shrunk to 0.90 ha. Thus, 73.8 per cent of the 200.7 lakh operational holdings in the state are marginal (below 1.0 ha) and another 15.5 per cent holdings are small (between 1 and 2 ha.).

Table 2.1 : Distribution of Operational Holdings in U.P. :
1990-91

Category	Number		Area	
	in '000	Per Cent	in '000 hect.	Per Cent
Marginal Holdings (Below 1.0 ha.)	14819	73.8	5653	31.4
Small Holdings (Between 1.0 to 2.0 ha.)	3118	15.5	4391	24.4
Semi-Medium Holdings (Between 2.0 to 4.0 ha.)	1543	7.7	4206	23.4
Medium Holdings (Between 4.0 to 10.0 ha.)	549	2.8	3042	16.9
Larger Holdings (Over 10.0 ha.)	45	0.2	694	3.9
All Holdings	20074	100.0	17986	100.0

Source : Agricultural Census, 1990-91

Due to the preponderance of the small holdings cropping pattern in U.P. is still largely subsistence oriented. Out of 256 lakh ha. of gross cropped area about 203 lakh ha. (around 80 per cent) are under foodgrain crops (Table 2.2). Wheat alone accounts for 35 per cent of cropped area and rice for another 21 per cent. Around 12 per cent of cropped area is under coarse cereals and another 12 per cent under pulses. Sugarcane and oilseeds are among the major commercial crops of the state accounting for around 7 per cent and 4.7 per cent of cropped area respectively.

The introduction of the new HYV technology had a tremendous impact on the agricultural economy of U.P. The green revolution spread rapidly in the state first in the western parts, but later extended to the central and eastern regions as well. The index of agricultural output with 1970-71 as base touched the figure of 195.3 in 1993-94. In the same year the index of output stood at 270.8 for wheat, 283.2 for rice and 207.8 for foodgrains. In case of non-foodgrain crops the increase was relatively lower with the index of output rising to only 158.7. Between 1980-81 and 1994-95 agricultural sector registered a satisfactory growth rate of 2.8 per cent in value terms. However, some deceleration in agricultural growth is observed since the beginning of the nineties.

Though yield levels in U.P. compare favourably with yield levels in India, they are still markedly behind the

Table 2.2 : Area, Output and Yield of Major Crops in U.P.
(Triennium Average for 1992-95)

Crop	Area (Lakh ha.)	Output (Lakh Tons)	Yield (Qtls. per ha.)
Rice	54.21	100.14	18.47
Wheat	89.78	210.72	23.47
Jowar	4.60	4.23	9.20
Bajra	8.05	9.25	11.49
Maize	10.80	14.70	13.61
Barley	3.82	7.22	18.90
Small Millets	2.94	3.16	10.75
<u>Total Cereals</u>	174.20	349.43	20.06
<u>Total Pulses</u>	28.56	24.86	8.70
<u>Total Foodgrains</u>	202.91	374.29	18.45
Ground Nut	1.31	1.19	9.08
Rapeseed and Mustard	7.72	7.04	9.09
Sugarcane	18.16	1056.39	581.71
Potato	3.86	66.72	174.42

Source : Calculated from Agricultural Statistics U.P.,
 Directorate of Agriculture (Annual).

yield levels in agriculturally developed states like Punjab and Haryana. Thus, productivity of wheat per ha. in 1994-95 was only 25.08 qtls. in U.P. as compared to 36.77 qtls. in

Haryana and 40.90 qtls in Punjab. Similarly rice yield during the same year was 18.67 qtls. per ha. in U.P. as compared to 28.01 qtls. in Haryana and 33.83 qtls. in Punjab. Sugarcane yield in U.P. is only 600 qtls. per ha., which is way behind the yield levels in Karnataka (962 qtls.) and Tamil Nadu (1139 qtls.).

2.2 Area, Output and Yields of Horticultural Crops in U.P. :

Uttar Pradesh is among the major fruit and vegetable producing states in India, growing a wide variety of horticultural crops. Presently, around 4.90 lakh ha. area in the state is under fruits and 6.73 lakh ha. area under vegetables (Table 2.3). Estimated output of fruits in U.P. amounted to 39 lakh M.T. in 1994-95 and that of vegetables 97 lakh M.T.

Mango is the most important fruit crop of U.P. with an estimated output of 23.87 lakh tonnes in 1994-95 accounting for about 60 per cent of fruit output and 54 per cent of fruit area. Guava is the next most important fruit crop with an area of about 18,000 ha. and estimated output of 1.56 lakh M.T., Citrus fruits are grown over 23,000 ha. area. A number of temperate fruits like apples, plum, apricot are also grown in the U.P. Himalayas. The production of apples is estimated at around 2.0 lakh tonnes. Kharbuja (musk melon) and tarbuja (water melon) are the major summer fruits grown in the state.

Table 2.3 : Area, Output and Yield of Major Horticultural Crops in U.P. (1994-95)

Crops	Area in hect.	Production in M.T.	Yield (qtls/ hect.)
<u>Fruits</u>			
Mango	2,66,166	23,87,201	89.69
Guava	18,246	1,56,194	85.60
Banana	1,443	28,993	200.92
Papaya	680	15,706	230.97
Citrus Fruits	23,278	66,058	28.38
Plum	13,101	27,661	21.11
Appricot	8,147	20,230	24.83
Litchi	8,664	11,425	13.19
Pear	11,159	28,479	25.52
Kathal	569	14,252	25.05
Kharbuja (Musk Melon)	26,680	6,95,015	26.05
Other Fruits	1,11,655	4,53,861	40.65
<u>Total Fruit Crops</u>	<u>4,89,788</u>	<u>39,05,075</u>	<u>79.73</u>
<u>Vegetables</u>			
Potato	3,75,325	68,21,313	181.74
Onions	27,710	3,19,202	115.19
Tomato	9,991	63,054	63.11
Sakarkhand	29,360	2,81,445	95.86
Other Vegetables	2,33,860	22,21,420	94.99
<u>Total Vegetables</u>	<u>6,73,246</u>	<u>97,06,434</u>	<u>144.17</u>
<u>Spices</u>			
Haldi	1,287	2,112	16.41
Dry Chillies	1,924	12,738	66.21
Dhania	6,476	3,970	6.13
Lahsun	7,156	31,135	43.51
Adarak	750	3,273	43.64
Jeera	18	8	4.44
Methi	527	328	6.22
Saunph	657	311	4.73
Other Spices	42,559	51,837	12.18
<u>Total Spices</u>	<u>61,349</u>	<u>1,05,715</u>	<u>17.23</u>

Source : Directorate of Horticulture, U.P.

Uttar Pradesh is a major producer of potato, which is grown in all parts of the state. An area of 3.75 lakh ha. is under potato cultivation, producing 68.21 lakh M.T. of output. Green vegetables cover 2.34 lakh ha. area, with an estimated output of 22.21 lakh M.T. Vegetables raised include cabbage, cauliflower, pea, french beans, carrot, capsicum, lady's finger, radish, etc. Other main vegetables grown in the state are onions, tomato and sakarkhand with a estimated output of 3.2, 0.6 and 2.8 lakh M.T.

Among other high value crops of the state are spices like haldi, chillies, dhanian, lehsun, etc. Presently about 61,000 ha. area is under spices. The estimated production of spices is put at 1.06 lakh M.T.

Flowers like marigold, bela, rose, etc. have been traditionally grown in the state. Recently cultivation of gladiolus has also started in some pockets. However, detailed information on area and production of flowers is not available. It is estimated that flower production amounted to 2 million pieces in 1995.

The average yields of both fruit and vegetable crops in Uttar Pradesh are generally much below the all India level (Table 2.4).

Table 2.4 : Yields of Selected Horticultural Crops in U.P. and India (M.T./Ha.)

Crops	U.P.	India	U.P. as % of India
<u>Fruits</u>			
Apples	3.95	6.11	64.6
Bananas	21.63	24.40	88.6
Citrus Fruits	2.42	7.26	33.3
Grapes	1.25	19.20	6.5
Guava	9.78	10.77	90.8
Litchi	1.24	4.87	25.5
Mango	5.58	8.11	68.8
<u>Vegetables</u>			
Onion	9.68	15.01	64.5
Potato	17.80	16.09	110.6
Tomatoes	6.47	15.71	41.2

Source : National Horticultural Board

2.3 Districtwise Area and Output of Horticultural Crops :

Table 2.5 shows districtwise area under fruits and vegetables. It will be noticed that Western districts specialise in the horticultural crops to a relatively greater extent and account for nearly half of vegetable area and 43.7 per cent of fruit area in the state. On the other hand,

Table 2.5 : District-wise Area Under Vegetables and Fruits in U.P., 1992-93

District	Area in Hect.		Area Under Fruits and Vegetables as Per cent of Gross Cropped Area		Area Under Fruits and Vegetables as Per cent of Area Under Crop in U.P.	
	Veget- ables	Fruits	Veget- ables	Fruits	Veget- ables	Fruits
Agra	12775	3079	3.44	0.83	2.06	0.99
Aligarh	11161	9102	1.79	1.46	1.20	2.92
Bareilly	13645	8231	2.65	1.60	2.20	2.64
Bijnore	4904	6921	1.06	1.50	0.79	2.22
Badaun	31011	6812	4.82	1.06	5.00	2.19
Bulandshahr	11770	12718	2.00	2.17	1.90	4.08
Etah	17549	10311	3.46	2.03	2.83	3.31
Etawah	15328	1667	3.43	0.37	2.47	0.53
Farrukhabad	67088	7784	15.19	1.76	10.81	2.50
Ferozabad	13716	1600	5.35	0.62	2.21	0.51
Ghaziabad	10213	3814	3.40	1.27	1.65	1.22
Hardwar	2997	3849	1.66	2.13	0.48	1.23
Mainpuri	14706	1974	5.31	0.71	2.37	0.63
Mathura	8328	972	1.90	0.22	1.34	0.31
Meerut	15935	9025	3.16	1.79	2.57	2.89
Moradabad	21303	13000	2.75	1.68	3.43	4.17
Muzaffarnagar	7601	6757	1.49	1.33	1.22	2.17
Pilibhit	4029	2442	1.08	0.66	0.65	0.78
Rampur	6112	5020	1.84	1.51	0.98	1.61
Saharanpur	4964	16820	1.11	3.76	0.80	5.40
Shahjahanpur	12862	4373	2.26	0.77	2.07	1.40
Western Region	307997	136271	3.22	1.43	49.63	43.71
Barabanki	17347	9697	3.69	2.06	2.80	3.11
Fatehpur	9010	1827	2.24	0.45	1.45	0.59
Hardoi	15878	7259	2.73	1.25	2.56	2.33
Kanpur Nagar	3432	944	3.94	1.08	0.55	0.30
Kanpur Dehat	17153	2666	2.42	0.53	2.76	0.86
Lakhimpur Kheri	3973	5192	0.60	0.78	0.64	1.67
Lucknow	11304	15369	5.47	7.44	1.82	4.93
Rae Bareli	9349	1231	2.26	0.30	1.51	0.39
Sitapur	7233	13736	1.25	2.37	1.17	4.41
Unnao	11799	10471	2.48	2.49	1.90	3.36
Central Region	106478	68392	1.58	1.58	17.16	21.94

Table 2.5 (contd....)

District	Area in Hect.		Area Under Fr-uits & Veget-ables as per cent of Gross cropped area		Area Under Fr-uits & Vegeta-bles as % of Area under crop in U.P.	
	Veget-ables	Fruits	Veget-ables	Fruits	Veget-ables	Fruits
Allahabad	23560	3890	3.51	0.58	3.80	1.24
Azamgarh	8966	2372	1.79	0.47	1.44	0.76
Bahraich	7379	6066	1.05	0.86	1.19	1.95
Ballia	9086	3993	2.68	1.18	1.46	1.28
Basti	7254	7865	1.47	1.58	1.17	2.52
Deoria	7522	10585	1.17	1.64	1.21	3.40
Faizabad	15576	9063	3.27	1.90	2.51	2.91
Ghazipur	12703	3915	3.26	1.01	2.05	1.26
Gonda	9083	3750	1.32	0.55	1.46	1.20
Gorakhpur	7050	6893	1.76	1.72	1.14	2.21
Jaunpur	14481	4270	3.22	0.95	2.33	1.37
Maharajganj	5475	4131	1.55	1.17	0.88	1.33
Mau	3498	1248	1.68	0.60	0.56	0.40
Mirzapur	4511	1568	1.60	0.56	0.73	0.50
Pratapgarh	10205	3164	2.95	0.91	1.64	1.01
Sonbhadra	900	57	0.37	0.02	0.15	0.02
Sidharthnagar	454	2685	0.12	0.72	0.17	0.86
Sultanpur	11632	15695	2.60	3.52	1.87	5.03
Vārānasi	11435	5065	2.30	1.04	1.84	1.62
Eastern Region	174862	96275	2.06	1.13	28.18	30.88
Almora	2477	399	1.39	0.22	0.40	0.13
Chamoli	2024	287	2.89	0.41	0.33	0.09
Dehradun	2199	2221	2.54	2.57	0.35	0.71
Nainital	5321	5871	1.52	1.68	0.86	1.88
Pithoragarh	3392	343	2.69	0.27	0.55	0.11
Pauri Garhwal	738	125	0.56	0.10	0.12	0.04
Tehri Garhwal	1778	92	1.56	0.08	0.29	0.03
Uttar Kashi	2052	512	4.59	1.15	0.33	0.16
Hill Region	19981	9850	1.82	0.90	3.22	3.16
Banda	1689	493	0.28	0.08	0.27	0.17
Hamirpur	2064	169	0.37	0.03	0.33	0.05
Jalaun	2196	119	0.57	0.03	0.35	0.04
Jhansi	3446	166	0.94	0.05	0.56	0.05
Lalitpur	1840	24	0.65	0.01	0.30	0.01
Bundelkhand	11235	971	0.51	0.04	1.81	0.31
UTTAR PRADESH	620553	311751	2.42	1.21	100.00	100.00

Source : Agricultural Statistics of U.P.

least area under these crops is found in Bundelkhand districts, which fall in the dry southern belt.

Among the districts specializing in vegetable cultivation with more than 3.0 per cent of gross cropped area under these crops are : Farrukhabad, Ferozabad, Mainpuri, Agra, Etah, Etawa, Badaun, Ghaziabad and Meerut in Western region; Barabanki and Kanpur in Central region; Allahabad, Faizabad, Ghazipur and Jaunpur in Eastern region; and Uttar Kashi in Hill region.

Districts with a relatively larger area under fruit crops (over 2 per cent of gross cropped area) are Bulandshahr, Etah, Hardwar and Saharanpur in Western region; Barabanki, Lucknow, Sitapur and Unnao in Central region; Sultanpur in Eastern region and Dehradun in Hill region.

Districtwise production of vegetables and fruits in U.P. is shown in Table 2.6. Western region contributes 51.4 per cent of vegetable output and 46.9 per cent of the fruit output of U.P. followed by Eastern region with a share of 25.0 and 22.9 per cent respectively. Central region contributes 14.2 per cent of vegetable output and 17.3 per cent of fruits output. The corresponding figures for Hill region are 8.0 and 12.6 per cent. Bundelkhand region contributes only a nominal part of horticultural output in U.P.

Table 2.6 : District-wise Production of Vegetables and Fruits in U.P., 1994-95 (in M.T.)

District	Production in M.T.		Per Cent Share in U.P.	
	Vegetables	Fruits	Vegetables	Fruits
Agra	284337	45644	2.93	1.17
Aligarh	182046	162611	1.88	4.16
Bareilly	164758	71947	1.70	1.84
Bijnore	61391	37760	0.63	0.97
Badaun	339510	94389	3.50	2.42
Bulandshahr	181674	205644	1.87	5.27
Etah	213602	106135	2.20	2.72
Etawah	249266	27482	2.57	0.70
Farrukhabad	1258855	93800	12.97	2.40
Ferozabad	306727	33002	3.16	0.85
Ghaziabad	184397	45218	1.90	1.16
Hardwar	49845	53972	0.51	1.38
Mainpuri	265643	35189	2.74	0.90
Mathura	163969	12284	1.69	0.31
Meerut	302745	58572	3.12	1.50
Moradabad	298069	258244	3.07	6.61
Muzaffarnagar	117137	58776	1.21	1.51
Pilibhit	51292	20167	0.53	0.52
Rampur	80088	75496	0.83	1.93
Saharanpur	75493	295025	0.78	7.55
Shahjahanpur	154119	40820	1.59	1.05
Western Region	4984963	1832177	51.36	46.92
Barabanki	239474	35708	2.47	0.91
Fatehpur	112808	20697	1.16	0.53
Hardoi	183074	88082	1.89	2.26
Kanpur Nagar	56298	15941	0.58	0.41
Kanpur Dehat	272043	39065	2.80	1.00
Kheri	40826	53497	0.42	1.37
Lucknow	128239	238662	1.32	6.11
Rae Bareli	92748	14931	0.96	0.38
Sitapur	86469	44046	0.89	1.13
Unnao	162221	123539	1.67	3.16
Central Region	1374200	674168	14.16	17.26

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2.4 Growth of Area and Output of Horticultural Crops : There has been a sharp growth in area and output of horticultural crops in U.P. over the entire planning period (Table 2.7). Fruits area increased from a modest 1.0 lakh ha. in the First Plan (1951-56) to 6.98 lakh ha. in the Seventh Plan (1985-90). Fruit output over the same period increased from 5.0 lakh M.T. to 56.6 lakh M.T. Equally sharp increases took place in the area and output of vegetable crops. Thus, vegetable area went up from 1 lakh ha. in the First Plan period to 8.3 lakh ha. in the Seventh Plan period. Vegetable output over the same period shot up 9 times from 10.0 lakh MT to 90.0 lakh MT.

The steady increase in horticultural area and output has continued unabated in the post reform period as well (Table 2.7). Thus, between 1990-91 and 1996-97 fruit area went up by 94,000 ha. and vegetable area by 1,52,000 ha. Increase in the output of fruits and vegetables over the same period was 22.78 lakh MT and 46.0 lakh MT respectively. Thus, over the last 6 years fruit area has increased by 13.1 per cent and vegetable area by 18.0 per cent. Output of fruits and vegetables during 1991-96 increased by 38.6 per cent and 40.7 per cent. These increases compares favourably with the increase of 35.6 per cent of fruit output and 38.1 per cent in vegetable output between 1991-92 and 1996-97 at the national level.

Table 2.7 : Trends in Area and Output of Horticultural Crops in U.P. Since 1951

(Area : Lakh Ha.;
Output : Lakh M.T.)

Period	Fruits		Vegetables		Potato	
	Area	Output	Area	Output	Area	Output
1951-56 (First Five Year Plan)	1.00	5.00	1.00	10.00	0.97	6.86
1956-61 (Second Five Year Plan)	1.50	9.00	1.50	15.00	1.13	7.99
1961-66 (Third Five Year Plan)	2.99	17.99	2.43	27.13	1.47	13.41
1969-74 (Fourth Five Year Plan)	3.49	21.79	3.07	36.08	1.87	17.20
1974-79 (Fifth Five Year Plan)	5.23	28.15	4.94	55.25	3.00	45.00
1980-85 (Sixth Five Year Plan)	5.80	38.39	7.41	89.92	3.05	52.56
1985-90 (Seventh Five Year Plan)	6.98	56.60	8.30	108.40	3.29	59.90
1990-91	7.16	59.00	8.45	113.00	3.23	61.45
1991-92	7.33	63.00	8.76	120.00	3.44	60.09
1992-93	7.49	66.00	9.21	124.27	3.72	54.71
1993-94	7.65	67.24	9.25	132.85	3.65	70.68
1994-95	7.78	72.50	9.50	143.00	3.73	67.94
1995-96	7.94	77.00	9.75	151.00	3.80	85.00
1996-97	8.10	81.78	9.97	159.00	4.25	84.00

Source : Directorate of Horticulture, U.P.

The annual rate of increase in fruit and vegetable area between 1990-91 and 1996-97 comes to 2.06 per cent and 2.80 per cent respectively, while the annual rate of increase in the output of these crops was 5.58 per cent and 5.85 per cent respectively. This implies an increase in the productivity levels at an annual rate of 3.52 per cent for fruits and 3.05 per cent for vegetables.

The area under horticultural crops as reported by Revenue Department is considerably lower than that reported by the Horticultural Directorate of the state. The increase in fruit area reported by Revenue Department is also much lower as compared to that reported by the Horticultural Directorate. Thus according to Revenue Department Statistics fruit area in U.P. increased by only 5.00 per cent between 1986-87 and 1993-94, most of the increase taking place in the Western Region (Table 2.8). In fact, according to Revenue Department Statistics area under fruit crops has remained static or even declined in a good number of districts of the state. Faster increase in fruit area is reported in districts of Saharanpur, Hardwar, Muzaffarnagar, Bulandshahr, Etah and Moradabad in Western U.P., Gorakhpur, Maharajganj, Basti and Sidharthnagar, Faizabad and Bahraich in Eastern U.P.; Lucknow, Unnao and Kheri in Central U.P.; and Nainital, Almora, Pithoragarh and Uttar Kashi in Hill Region. Thus, fruit area expansion has taken place mainly in the Hill region and the sub-mountainous Tarai region of the state.

Table 2.8 : Region-wise Growth in Area Under Fruits and Vegetables in U.P. (In Ha.)

Region	Area Under Fruits			Area Under Vegetables		
	1986-87	1993-94	% Increase	1986-87	1993-94	% Increase
Western Region	125931	136271	8.21	249781	307997	23.31
Central Region	67141	68392	1.86	79222	106478	34.40
Eastern Region	92896	96275	3.64	150234	174862	16.39
Hill Region	9370	9850	5.12	17140	19981	16.58
Bundelkhand Reg.	1759	971	-44.80	8492	11235	32.30
Uttar Pradesh	297097	311751	4.93	504869	620553	22.91

Source : Agricultural Statistics of Uttar Pradesh (Annual)

The vegetable area, on the other hand, has registered a fairly sharp increase of 23 per cent in the state between 1986-87 and 1993-94 according to the Revenue Department statistics (Table 2.8). Moreover, increase in vegetable area is reported to have increased in all parts of the state though western and central districts have reported larger gains in area.

3.0 SOCIO-ECONOMIC CHARACTERISTICS OF RESPONDENTS

3.1 Caste : Majority of the respondents (57.22 per cent) belonged to the backward castes followed by the higher castes (40.56 per cent), while the number of scheduled caste respondents was negligible (2.22 per cent). It needs also to be noted that in the hill district of Nainital an overwhelming majority belonged to the upper castes, while in Jaunpur and Jhansi districts backward caste respondents constituted the dominant category (Table 3.1).

Table 3.1 : Distribution of Respondents by Caste

Caste	Jaunpur	Jhansi	Nainital	Total
Higher Caste	8 (13.33)	7 (11.67)	58 (96.67)	73 (40.56)
Backward Caste	50 (83.34)	53 (88.33)	-	103 (57.22)
Scheduled Caste	2 (3.33)	-	2 (3.33)	4 (2.22)
Total	60(100.00)	60(100.00)	60(100.00)	180(100.00)

3.2 Age : Age structure of respondents revealed that a little less than two-thirds (38.89 per cent) were in the young age group (15-45 years) and nearly the same proportion in the middle age group (46.60 years). Around one-fourth of the respondents were above 60 years in age (Table 3.2).

Table 3.2 : Distribution of Respondents by Age-Group

Age Group (Yrs)	Jaunpur	Jhansi	Nainital	Total
0 - 14	-	-	-	-
15 - 45	26 (43.33)	30 (50.00)	14 (23.33)	70 (38.89)
46 - 60	18 (30.00)	20 (33.33)	29 (48.33)	67 (37.22)
60 +	16 (26.67)	10 (16.67)	17 (28.34)	43 (23.89)
Total	60(100.00)	60(100.00)	60(100.00)	180(100.00)

3.3 Education : The study of the educational profile of the respondents reveals that 70.01 per cent had received formal education, while another 12.22 per cent were literate. 10.56

Table 3.3 : Distribution of Respondents by Educational Level

Education	Jaunpur	Jhansi	Nainital	Total
Illiterate	15 (25.00)	15 (25.00)	2 (3.33)	32 (17.77)
Literate	13 (21.67)	5 (8.33)	4 (6.67)	22 (12.22)
Primary	11 (18.33)	15 (25.00)	17 (28.33)	43 (23.89)
Secondary	8 (13.33)	15 (25.00)	22 (36.67)	45 (25.00)
Intermediate	4 (6.67)	5 (8.33)	10 (16.67)	19 (10.56)
Graduation	9 (15.00)	5 (8.34)	5 (8.33)	19 (10.56)
Total	60(100.00)	60(100.00)	60(100.00)	180(100.00)

per cent of the respondents were educated upto graduation level. Respondents from Nainital district showed a better educational profile. Less than one-fifth of the respondents (17.77 per cent) were found to be illiterate.

3.4 Occupational Pattern : Agriculture is the traditional occupation of the respondents, with 93.33 per cent reporting agriculture as their parental occupation. The remaining 6.67 per cent came from business or service families. The sample consisted entirely of self-cultivating farmers, with 80.00 per cent reporting agriculture as their primary occupation. Remaining 20.00 per cent were engaged in private business or service and were pursuing agriculture as their secondary occupation. Over two-thirds of the respondents (67.77 per cent) were also pursuing some secondary occupation. 60.00

Table 3.4 : Distribution of Respondents by Primary and Secondary Occupation

Occupational Category	Primary Occupation	Secondary Occupation
Agriculture	144 (80.00)	36 (29.51)
Rural Labour	2 (1.11)	15 (12.29)
Self-Employed	14 (7.78)	6 (4.92)
Service	20 (11.11)	2 (1.64)
Animal Husbandry	-	63 (51.64)
Total	180(100.00)	122(100.00)

per cent of the respondents who reported agriculture as their main occupation were engaged in some secondary occupation. Animal husbandry was reported as the main secondary occupation by the respondents (Table 3.4).

3.5 Household Size and Structure : Average household size of the respondents was 6.51 consisting of 3.62 males (55.63 per cent) and 2.89 females (44.37 per cent). On average there were 1.93 children below 15 years in age constituting 29.78 per cent of household population (Table 3.5). Number of workers per household was found to be 2.92 giving a worker-dependent ratio of 1: 1.23. A good proportion of females participate in economic activity on own farm or elsewhere. Only 28.65 per cent of females in the sample household were classified as housewife.

Table 3.5 : Demographic Structure of Sample Households

Category	Average No. per Household	Per Cent
Total Members	6.51	100.00
Male	3.62	55.63
Female	2.89	44.37
Children	1.93	29.78
Adults	4.58	70.22
Workers	2.92	44.88
Non-Workers	3.59	55.12

Looking at the occupational structure of the workers as many as 74.90 per cent reported agriculture as the primary occupation and 4.37 per cent reported rural labour as their primary occupation (Table 3.6). About 52 per cent of the workers were also engaged in some secondary occupation mainly in animal husbandry (55.85 per cent) and agriculture (25.18 per cent). Around 15 per cent of secondary workers were engaged in rural labour (Table 3.7).

Table 3.7 : Distribution of Household Workers by Occupation

Occupation	Primary	Secondary
Agriculture	394 (74.90)	69 (25.18)
Animal Husbandry	7 (1.33)	153 (55.85)
Rural Labour	23 (4.37)	41 (14.98)
Self-Employed	50 (9.51)	10 (3.65)
Service	52 (9.89)	1 (0.36)
Total Workers	526(100.00)	274(100.00)

4.0 HOUSEHOLD ASSETS AND INCOME

4.1 Household Assets : The economic status of the households can be judged from the ownership of assets. In our sample we found that 77.78 per cent of households were living

in pucca houses and 22.22 per cent in kutchha houses. As far as ownership of vehicles is concerned 26.11 per cent of households had a scooter or a motor cycle, while 1 household owned a jeep and 1 owned a truck. Ownership of TV set was also found to be quite common with 62.22 per cent households owning a TV set. Around 12 per cent of households owned a refrigerator and less than 2 per cent owned a washing machine. The average value of physical assets owned by the sample households was reported at Rs.81,045 (Table 4.1).

Table 4.1 : Ownership of Durable Assets by Sample Households

Type of Assets	Households Reporting Ownership		Average Value of Assets per Household (Rs.)	
	No.	Per Cent	Households Reporting Ownership	All Households
1. <u>Residential House</u>				74,218
Kutchha	40	22.22	13,630	3,029
Pucca	140	77.78	91,529	71,189
2. <u>Vehicles</u>				6,956
Scooter	30	16.67	18,300	3,050
Motor Cycle	17	9.44	20,765	1,961
Jeep	1	0.01	50,000	278
Truck	1	0.01	3,00,000	1,667
3. <u>Consumer Goods</u>				3,777
T.V.	112	62.22	4,684	2,914
Refrigerator	21	11.67	6,929	808
Washing Machine	3	1.66	3,233	54
4. <u>Total Assets</u>				81,045

4.2 Farm Equipment/Machinery : Cultivation is still practiced with traditional equipment or through hiring of modern machinery when required. Only 5 per cent of sample households owned a tractor and 8.88 per cent owned a thresher. Pump sets were, however, owned by 33.33 per cent of sample households and another 2.78 per cent owned tubewell. The total value of farm equipment and machinery amounted to Rs.10,833 per household (Table 4.2).

Table 4.2 : Ownership of Farm Equipment/Machinery by Sample Households

Type of Equipment/ Machinery	Households Reporting Ownership		Value Per Household (in Rs.)	
	Number	Per Cent	Reporting Ownership	All Households
Farm House	8	4.44	59,000	2,622
Tractor	9	5.00	92,667	4,633
Tubewell	5	2.78	12,000	333
Pump Set	50	33.33	9,670	2,686
Thresher	16	8.88	4,713	419
Cane Crusher	3	1.66	4,266	71
Persian Wheel	4	2.22	3,050	68
Total Value of Assets	-	-	-	10,833

4.3 Livestock : The sample households kept on average 2.89 livestock. The number of draft animals per sample household was only 0.58 as it is no longer economical to maintain draft

animal due to small size of holding. However, most of the households maintained a milch animal. On an average 1.6 milch animals were kept by the sample households. Cows was the most popular milch animal followed by she buffalo. A few poor households also kept goats (Table 4.3).

Table 4.3 : Average Number of Livestock Owned by Sample Households

Category	No. per Sample Household
Bullock	0.57
Draft Buffalo	0.51
Milch Cow	0.74
Milch Buffalo	0.59
Young stock cattle	0.46
Young stock Buffalo	0.25
Goats	0.26
Total Livestocks	2.89

4.4 Household Income : Total household income of the sample households was fairly high at Rs.57,114, while per capita income was Rs.8,773 (Table 4.4). Per capita income was distinctly lower in Jaunpur (Rs.6238) as compared to Jhansi (Rs.9,727) and Nainital (Rs.10,634). It may be observed that income levels of the sample households are distinctly higher than the per capita income of the state, which stood

at Rs.4,744 in 1993-94. This points to the income enhancing effect of crop diversification.

Table 4.4 : Source-wise Average Annual Household Income for Sample Farmers (Rs.)

Source	Jaunpur	Jhansi	Nainital	Total
Agriculture	23496 (54.2)	28654 (46.2)	45171 (68.5)	32440 (56.8)
Animal Husbandry	7280 (16.8)	10732 (17.3)	7494 (11.4)	8502 (14.9)
Hiring out of Machinery	356 (0.8)	257 (0.4)	20 (0.03)	221 (0.4)
Rent from Leasing out Land	100 (0.2)	360 (0.6)	100 (0.2)	187 (0.3)
Rural Labour	1075 (2.5)	3377 (5.4)	150 (0.2)	1534 (2.7)
Business	3600 (8.3)	5200 (8.4)	3783 (5.7)	4194 (7.3)
Service	7117 (16.4)	13447 (21.7)	9213 (14.0)	9926 (17.4)
Remittances	333 (0.8)	-	-	111 (0.2)
Total Household Income	43357 (100.0)	62056 (100.0)	65931 (100.0)	57114 (100.0)

Note : Figures in brackets show per cent contribution to total households income.

Agriculture contributed around 57 per cent of household income in our sample, while animal husbandry contributed

another 15 per cent. The other major source of income was service which contributed around 17 per cent of household income. Remaining 11 per cent of income was derived from various sources such as business, rural labour, remittances, hiring out of land and machinery, etc. (Table 4.4).

Table 4.5 : Source-wise Household Income by Size Category of Holdings (Rs.)

Source	0-1	1-2.5	2.5-5.0	5.0-10.0	10.0+	Total
Agriculture	18834 (40.8)	17964 (42.5)	33958 (64.6)	83038 (72.8)	121982 (81.6)	32440 (58.8)
Animal Husbandry	9634 (20.9)	6025 (14.2)	7546 (14.3)	13860 (12.1)	15200 (10.2)	8502 (14.9)
Hiring out of Machinery	299 (0.7)	106 (0.2)	379 (0.7)	-	375 (0.2)	221 (0.4)
Rent from Leasing out Land	432 (0.9)	-	205 (0.4)	235 (0.2)	-	187 (0.4)
Rural Labour	1954 (4.2)	2361 (5.6)	579 (1.1)	-	-	1534 (2.7)
Business	6044 (13.1)	1846 (4.4)	6026 (11.5)	2824 (2.5)	6000 (4.0)	4194 (7.3)
Service	8808 (19.1)	13930 (33.0)	3569 (6.8)	14094 (12.4)	6000 (4.0)	9926 (17.4)
Remittances	120 (0.3)	30 (0.1)	308 (0.6)	-	-	111 (0.2)
Total Household Income	46124 (100.00)	42262 (100.00)	52571 (100.00)	114019 (100.00)	149557 (100.00)	57114 (100.00)

Note : Figures in brackets show per cent contribution to total households income.

Looking at the household income by size category of holdings we find that average household income rises from Rs.46,124 for holdings below 1 acre to Rs.1,49,557 for holdings above 10 acres (Table 4.5). It is also interesting to find that the share of agriculture in household income rises sharply with the rise in the size of holding. Whereas agriculture contributed only around 40 per cent of household income on holdings upto 2.5 acres this share was around 82 per cent for holdings above 10 acres. Thus, the small land holders are under much greater economic pressure to raise their income levels with supplementary activities like animal husbandry, small business, service, etc.

5.0 HOLDING SIZE, IRRIGATION AND CROPPING PATTERN

5.1 Area Owned and Operated : Total operational area of the sample households was 510.35 acres and total owned area 512.44 acres. The land was primarily self-cultivated. The incidence of leasing was extremely low. Only 0.67 per cent of operated area was leased in and 1.08 per cent leased out. The size of sample holding was 2.84 acres only (Table 5.1). Holding size was relatively higher in Nainital (4.17 acres) as compared to Jhansi (2.54 acres) and Jaunpur (1.80 acres).

Table 5.1 : Area Owned and Operated by Sample Households

Item	(Acres)			
	Jaunpur	Jhansi	Nainital	Total
Area Owned	109.24 (1.82)	149.95 (2.50)	253.25 (4.22)	512.44 (2.85)
Area Leased in	1.25 (0.02)	2.16 (0.04)	-	3.41 (0.02)
Area Leased out	2.50 (0.04)	-	3.00 (0.05)	5.50 (0.03)
Area Operated	107.99 (1.80)	152.11 (2.54)	250.25 (4.17)	510.35 (2.84)

Note : Figures in bracket show average area per sample household.

Distribution of sample households by size category of holding has been shown in Table 5.2. Nearly 65 per cent of the holdings in our sample were marginal (below 2.5 acres) and another 21.67 per cent were small (between 2.5 and 5.0 acre). A little less than 10 per cent of holdings were medium (5.0 to 10.0 acres), while less than 5 per cent were large (above 10 acres). This distribution corresponds to the pattern of land distribution in the state as a whole. The pattern of land holdings is somewhat different in Nainital where less than 40 per cent of sample holdings belonged to the marginal category.

Table 5.2 : Distribution of Sample Holdings by Size of Land, Holding (Nos.)

Size Category (Acre)	Jaunpur	Jhansi	Nainital	Total
Less than 1.0	23(38.33)	25(41.67)	2(3.33)	50(27.78)
1.00 - 2.49	27(45.00)	18(30.00)	21(35.00)	66(36.67)
2.49 - 4.99	7(11.67)	9(15.00)	23(38.33)	39(21.67)
4.99 - 9.99	1(1.67)	6(10.00)	10(16.67)	17(9.44)
10.0 +	2(3.33)	2(3.33)	4(6.67)	8(4.44)
All Categories	60(100.0)	60(100.0)	60(100.0)	60(100.0)

Note : Figures in bracket show percentage to total holdings.

5.2 Irrigation : Nearly 90 per cent of gross sown area was irrigated for the sample farms. While in Jaunpur and Jhansi around 95 per cent of gross sown area was irrigated, this proportion was around 80 per cent in Nainital (Table 5.3). This was mainly on account of the fact that only 11.3 per cent of area under fruits in the hill district was under irrigated conditions. In the two plains districts fruit cultivation is mainly under irrigated conditions.

Pumpsets are the major source of irrigation in Jaunpur and Jhansi districts. In the hill district of Nainital entire area was irrigated by canals, while in Jhansi over one-third area was irrigated by this source (Table 5.4). Hiring of water from tubewells and pumpsets is practiced widely.

Table 5.3 : Crop-wise Irrigated Area on Sample Farms

(Per Cent)

Crop	Jaunpur	Jhansi	Nainital	Total
Foodgrains	95.13	94.62	99.94	97.57
Sugarcane	100.00	100.00	100.00	100.00
Oilseeds	100.00	100.00	99.62	99.85
Vegetables	100.00	100.00	100.00	100.00
Flowers	100.00	100.00	100.00	100.00
Fruits	88.54	94.51	11.26	51.35
Spices	—	100.00	100.00	100.00
Gross Cropped Area	95.00	96.80	80.68	88.41

Table 5.4 : Irrigated Area by Source on Sample Farms
As Per Cent of Net Irrigated Area

Source of Irrigation	Jaunpur	Jhansi	Nainital	Total
Canal	—	35.55	100.00	53.97
Tubewells	21.95	2.94	—	6.16
(a) Own	12.97	2.28	—	3.83
(b) Hired	8.98	0.66	—	2.33
Pumpsets	78.05	54.57	—	37.43
(a) Own	53.52	49.45	—	29.90
(b) Hired	24.53	5.12	—	7.53
Wells etc.	—	6.94	—	2.44
Total Irrigated Area	100.00	100.00	100.00	100.00

In spite of the availability of irrigation facilities only 45 per cent of area is double cropped. A relatively higher area under fruits tends to reduce the intensity of cropping.

5.3 Cropping Pattern : The study of cropping pattern of sample farms reveals that less than half of the area (45.75 per cent) was under foodgrains. Among non-foodgrain crops largest proportion of area (21.50 per cent) was under fruits followed by vegetables (15.88 per cent), while flowers accounted for 5.95 per cent of cropped area (Table 5.3). Oilseeds accounted for a little less than 10 per cent of cropped area. Area under sugarcane and spices was, however, negligible. No significant differences in the cropping pattern on sample farms were observed among the districts studied, except that oilseed was grown on a relatively larger area in Jhansi.

Table 5.5 : Cropping Pattern on Sample Farms

(Acres)

Crop	Jaunpur		Jhansi		Nainital		Total	
	Area	%	Area	%	Area	%	Area	%
Foodgrains	75.15	48.57	83.24	39.29	180.40	48.25	338.79	45.75
Sugarcane	1.80	1.16	0.25	0.12	10.55	2.82	12.60	1.70
Oilseeds	5.58	3.61	34.03	16.06	26.15	6.99	65.76	8.88
Vegetables	27.71	17.91	36.52	17.16	53.36	14.27	117.59	15.88
Flowers	8.90	5.75	13.89	6.56	21.25	5.68	44.04	5.95
Fruits	35.59	23.00	42.42	20.02	81.20	21.72	159.21	21.50
Spices	-	-	1.53	0.72	1.00	0.26	2.53	0.34
Gross Cro- ped Area	154.73	100.0	211.88	100.0	373.91	100.0	740.52	100.0

Looking at the cropping pattern by size category of farms we find that the farmers with tiny holdings (below 1.0 acre) specialized in the growing of non-foodgrain crops particularly vegetables and flowers, which are more labour intensive high value crops (Table 5.6). Area under vegetables and flowers declined with the size of holding. Large holdings (above 10 acres) preferred to grow fruits to a greater extent. The middle farmers had relatively much lower area under fruits and relied on growing foodgrain crops to a relatively greater extent.

Table 5.6 : Cropping Pattern on Sample Farms by Size Category of Farms

Size Category (Acres)	Per Cent of Gross Cropped Area Under							
	Food- grain	Sugar- cane	Oil- seeds	Vege- table	Flow- ers	Fruits	Spices	Total
0- 1.0	19.6	-	7.0	38.6	8.3	22.1	4.0	100.00
1- 2.5	45.2	0.6	5.4	13.7	10.9	24.2	-	100.00
2.5-5.0	52.2	0.3	7.3	20.0	7.4	12.8	-	100.00
5.0-10.0	47.1	2.9	12.7	15.4	4.8	17.1	-	100.00
10.0+	42.3	3.2	9.3	8.8	1.2	34.6	0.6	100.00
Total	45.8	1.7	8.9	15.9	5.9	21.5	0.3	100.00

5.4 Share of Different Crops in Agricultural Income : An idea of relative profitability of crops can be had from a comparison of the per cent share of a crop in cropped area and net output from agriculture. Flowers emerge as the most profitable crop followed by vegetables and fruits with a profitability ratio of 2.21, 1.76 and 1.43 respectively. Foodgrains had the least profitability ratio of 0.43 only (Table 5.7).

Table 5.7 : Per Cent Share of Crops in Area and Net Output From Agriculture

Crops	Share in Area (%)	Share in Net Output from Agriculture (%)	Ratio of 3/2
Foodgrains	45.75	19.15	0.43
Sugarcane	1.70	2.25	1.21
Oilseeds	8.88	5.88	0.73
Vegetables	15.88	27.75	1.76
Flowers	5.95	13.05	2.21
Fruits	21.50	31.71	1.43
All Crops	100.00	100.00	-

Clear differences in the relative contribution of different crops to net agricultural output were observed in case of different size categories of farmers (Table 5.8). The very small farmers (upto 1.0 acre) derived bulk of their income from vegetable and flower cultivation as compared to other categories. The large farmers (above 10.0 acres) preferred to grow fruits and foodgrains to a much greater extent. High labour requirement of vegetables and flowers seems to make these crops less attractive to the large farmers, but marginal farmers with surplus labour power and adverse land-man ratio prefer to grow these crops because of their greater profitability.

Table 5.8 : Share of Different Crops in Net Agricultural Output on Sample Farms by Size Category
(Per Cent)

Crops	0.0-1.0	1.0-2.5	2.5-5.0	5.0-10.0	10.0+
Foodgrains	4.6	17.6	26.1	19.7	26.1
Sugarcane	-	0.5	0.5	4.0	2.2
Oilseeds	2.9	2.7	3.7	8.3	5.9
Vegetables	41.9	20.8	33.5	27.8	27.8
Flowers	29.8	15.9	12.5	7.7	13.1
Fruits	19.9	42.5	23.7	32.5	31.7
Spices	0.9	-	-	0.3	0.2
Net Agriculture Output	100.0	100.0	100.0	100.0	100.0

6.0 COST OF CULTIVATION PER ACRE

To study the input and cost structure the following items have been taken into account :

- (a) Value of hired human labour (cash and kind)
- (b) Value of seeds/plants (home produced and purchased)
- (c) Value of manures (home produced and purchased)
- (d) Value of fertilizers
- (e) Value of pesticides
- (f) Irrigation charges (operating cost of own means of irrigation and value of purchased water)
- (g) Value of hired animal labour and machinery
- (h) Transport and marketing charges.

The concept of cost used by us includes operating cost (purchased and home produced) plus transport and marketing charges but excludes items like depreciation and interest on working capital. Imputed value of family labour and rental value of owned land have also not been taken into account.

The cost of cultivation per acre is highest for flowers (Rs.7993) followed by fruits (Rs.7245) and vegetables (Rs.5907). It was lowest for foodgrains (Rs.1978). Thus input levels are 3 to 4 times higher for commercial crops as compared to foodgrain crops. The input levels are generally lower in Jhansi district. Above average input level were observed in case of sugarcane and flowers in Jaunpur district and in case of fruits in Nainital district (Table 6.1).

Table 6.1 : Per Acre Cost of Cultivation of Main Crops on Sample Farms (Rs.)

Crops	Jaunpur	Jhansi	Nainital	Total
Foodgrains	2109	1708	2048	1978
Sugarcane	7399	4912	4456	4886
Oilseeds	1866	2222	2014	2109
Vegetables	6682	5106	6053	5907
Flowers	16385	6442	5491	7993
Fruits	3567	3358	10887	7245
Spices	-	2297	1575	2011
All Crops	4137	3025	4799	4153

Item-wise cost of cultivation has been shown in Table 6.2. Hired labour accounts for 25.4 per cent of total operating cost. Seeds and plants account for 13.1 per cent of total cost, while manures, fertilizers and pesticides account for 23.0 per cent and irrigation charges for 5.0 per cent of cost. The share of transport and marketing was found to be fairly high at 25.2 per cent. Considerable differences in the cost structure for different crops are also observed.

Table 6.2 : Item-wise Cost of Cultivation per Acre for Different Crops on Sample Farms

Crops	Hired Lab-our	Seeds/Plants	Man-ure	Fert-lizer	Pesti-cides	Irri-gation	Hired Machi-nary/ Ani-mals	Trans-Port Mark-eting	Total
Foodgrains	563 (28.5)	231 (11.7)	79 (4.0)	446 (22.5)	90 (4.6)	111 (5.6)	315 (15.9)	143 (7.2)	1978 (100.0)
Sugarcane	942 (19.3)	1439 (29.5)	246 (5.0)	723 (14.8)	99 (2.0)	90 (1.8)	422 (8.6)	925 (18.9)	4886 (100.0)
Oilseeds	507 (24.0)	323 (15.3)	49 (2.3)	375 (17.8)	124 (5.9)	190 (9.0)	386 (18.3)	154 (7.3)	2109 (100.0)
Vegetables	1215 (20.6)	1184 (20.0)	179 (3.0)	826 (14.0)	256 (4.3)	367 (6.2)	477 (8.1)	1403 (23.8)	5907 (100.0)
Flowers	1616 (20.2)	1391 (17.4)	269 (3.4)	1163 (14.6)	831 (10.4)	633 (7.9)	620 (7.8)	1470 (18.4)	7993 (100.0)
Fruits	2077 (28.7)	513 (7.1)	169 (2.3)	539 (7.4)	546 (7.5)	204 (2.8)	219 (3.0)	2978 (41.1)	7245 (100.0)
Spices	237 (11.8)	353 (17.6)	316 (15.7)	445 (22.1)	-	176 (8.8)	411 (20.4)	73 (3.6)	2011 (100.0)
Total	1055 (25.4)	542 (13.1)	126 (3.0)	567 (13.7)	261 (6.3)	209 (5.0)	347 (8.4)	1046 (25.2)	4153 (100.0)

The proportion of cost of hired labour, machinery as well as fertilizer is relatively higher for foodgrain crops. Among non-foodgrain crops the proportion of cost on manures, fertilizers and pesticides was relatively higher for flowers. The share of transport and marketing charges was highest for fruits (41.1 per cent) followed by vegetables (23.8 per cent).

Table 6.3 : Crop-wise Cost of Cultivation per Acre on Sample Farms (Rs.)

Crops	Hired Lab-our	Seeds/Plants	Man-ure	Fert-lizer	Pesti-cides	Irri-gation	Hired Machi-nary/ Ani-mals	Trans-port Mark-eting	Total
Rice	760	144	56	433	133	81	361	74	2042
Wheat	475	346	78	593	67	174	402	52	2187
Maize	446	150	117	190	27	90	352	84	1456
Other Coarse Cereals	539	237	20	97	-	39	346	43	1321
Pulses	342	277	17	162	3	116	455	25	1397
Groundnut	419	374	84	289	145	228	310	52	1901
Mustard	670	238	9	597	20	226	604	90	2454
Soyabean	429	306	7	301	138	141	427	59	1808
Potato	1397	2895	284	1445	153	625	825	781	8405
Onion	1173	813	88	844	41	436	863	448	4706
Tomato	1599	993	165	890	464	292	869	1719	6991
Lady Finger	457	289	115	272	109	295	396	629	2562
Brinjal	723	338	166	286	94	288	479	639	3013
Peas	737	735	39	563	37	238	472	543	3364
Cauliflower	693	575	320	608	48	567	626	1557	4994
Bela	2905	3063	452	2200	1416	1501	1156	1550	14243
Marigold	969	1001	192	1112	792	813	386	875	6140
Rose	993	1361	279	1220	762	740	487	840	6682
Gladiolous	1216	838	139	619	833	48	652	1548	5893
Guava	926	212	144	627	235	256	86	526	3012
Mango	1560	800	73	743	771	475	627	1340	6389
Apple	2743	391	248	417	995	-	217	4813	9824
Peach	3789	338	225	514	1006	-	356	6048	12276
Plum	2719	523	179	508	912	-	402	4461	9704
Apricot	3080	559	191	667	1016	-	417	5725	11655
Lemon	1613	926	131	1022	705	579	351	385	5712

Details of cost of cultivation per acre for individual crops have been shown in Table 6.3. Considerable differences in cost of cultivation per acre can be observed for individual crops in each crop group. Among cereals cost levels are higher for wheat and rice as compared to coarse cereals and pulses. Among vegetables per acre cost is distinctly higher for potato and tomato as compared to the green vegetables. In case of flowers cost levels were much higher for bela. For the fruit group cost levels for fruits grown in hills (apple, peach, plum and apricot) are much higher as compared to fruits grown in the plains (mango, guava and lemon).

7.0 PER ACRE PRODUCTIVITY

Physical productivity of major crop groups on the sample farms has been shown in Table 7.1. Average productivity for foodgrains is 11.81 qtls/acre and that of oilseeds 7.14 qtls/acre. Productivity of vegetables and fruits comes to 48.44 qtls/acre and 43.56 qtls/acre respectively and for flowers 15.97 qtls/acre. The differences in productivity of foodgrains were not very sharp across districts. For non-foodgrain crops productivity levels were found to be relatively higher in Jaunpur. Productivity levels were found to be lowest in Jhansi except for oilseeds, with Nainital falling in the middle category.

Productivity of individual crops has been shown in Table 7.2. For cereals productivity levels were found to be higher in Jaunpur (except in case of rice) followed by Nainital, but groundnut and mustard yields were higher in Jhansi. In case of vegetables like potato, onions, tomato and brinjal yield levels were distinctly higher in Jaunpur followed by Jhansi. Yield of lady's finger and cauliflower were higher in Jhansi. Except for peas yields of vegetables were lower in Nainital.

Table 7.1 : Per Acre Productivity of Major Crops on Sample Farms (in Qtls)

Crops	Jaunpur	Jhansi	Nainital	Total
Foodgrains	11.60	10.20	12.65	11.81
Sugarcane	243.33	160.00	227.49	228.41
Oilseeds	6.13	8.55	5.53	7.14
Vegetables	63.51	47.89	40.99	48.44
Flowers*	18.54	14.33	-	15.97
Fruits	39.02	30.17	42.89	43.56
Spices	-	9.15	3.00	6.72

*Excluding gladiolus

Jaunpur was again found the leading district in yield of flowers like bela and marigold followed by Nainital. But in the case of roses Jhansi had the highest yield level. On the other side, in case of the average yield of fruits Nainital farmers had a distinct edge.

Table 7.2 : Productivity of Individual Crops on Sample Farms
(Per Acre)

Crops	Jaunpur	Jhansi	Nainital	Total
<u>Foodgrains</u>				
Rice	12.91	11.23	14.28	13.60
Wheat	13.69	10.98	12.87	12.42
Maize	10.03	5.47	5.86	8.46
Coarse Cereals	10.89	3.63	6.79	6.84
Pulses	4.81	4.15	5.25	4.66
<u>Oilseeds</u>				
Groundnut	-	9.79	-	9.79
Mustard	7.49	8.97	7.17	7.49
Soyabean	4.62	2.70	4.59	4.09
<u>Vegetables</u>				
Potato	84.71	70.52	69.85	76.15
Onions	61.22	46.92	32.95	42.42
Tomato	81.05	64.75	43.36	49.57
Lady Finger	32.87	34.07	17.31	31.15
Brinjal	43.15	32.80	20.00	38.53
Peas	19.09	5.97	19.32	18.12
Cauliflower	62.67	79.56	-	72.80
<u>Flowers</u>				
Bela	18.33	12.00	-	16.64
Marigold	21.53	14.94	-	16.58
Rose	14.62	15.16	-	15.11
Gladiolus*	-	1786	1179	1183
<u>Fruits</u>				
Guava	37.99	26.93	50.00	32.82
Mango	39.78	36.71	63.35	45.09
Apple	-	-	36.82	36.82
Peach	-	-	49.28	49.28
Plum	-	-	40.09	40.09
Apricot	-	-	47.53	47.53
Lemon	-	20.71	20.00	20.66

*Yield of gladiolus is in dozens

In short in terms of yield levels Jaunpur district had a comparative advantage in case of wheat, coarse grains, vegetables and flowers, while Nanital had a clear comparative advantage in case of rice and fruit crops. Jhansi, on the other hand, had a comparative advantage in case of oilseeds, green vegetables and lemon.

8.0 GROSS AND NET INCOME PER ACRE

Gross income per net area sown on sample farms came to Rs.17,563 and net income to Rs.11,504. Significantly an inverse relation was observed between the gross and net returns per acre and the size of holding (Table 8.1). Net income per acre was highest at Rs.17,750 for the lowest size category (upto 2.5 acres) and came down to Rs.7,684 on holdings above 10 acres. The marginal farmers are not only making a much more intensive use of land, they were also found to be more efficient cultivators in terms of input-output ratio. Differences in cost and returns were not found to be significant for the size group 2.5 to 5.0 acres and 5.0 to 10.0 acres. But costs and returns were distinctly lower for the above 10.0 acres category. Thus, our study clearly indicates the relative advantage of marginal and small holdings in growing vegetables and flowers.

Table 8.1 : Gross and Net Income per Net Acre Sown on Sample Farms by Size Category (Rs.)

Size Category (in acres)	Gross Income	Cost of Cultiva- tion	Net Income	Ratio of Gross to Cost
Upto 2.50	25503	7753	17750	3.29
From 2.50 to 5.00	16659	6250	10409	2.67
From 5.00 to 10.0	16300	5726	10574	2.85
Above 10.00	12304	4620	7684	2.66
All Groups	17563	6059	11504	2.90

The gross and net value of output per acre for major crop groups has been shown in Table 8.2. Net output per acre was distinctly higher for flowers (Rs.17,304) and vegetables (Rs.13,781) followed by fruits (Rs.11,630) and sugarcane (Rs.10,418). Net output per acre was much lower for oilseeds (Rs.5,221) and foodgrains (Rs.3,302). Thus, in terms of net returns cultivation of flowers is 5.2 times more profitable as compared to foodgrain cultivation and that of vegetables and fruits 4.2 times and 3.5 times more profitable. Output-input ratio was also found more favourable for these crops as compared to foodgrain cultivation.

These figures show the high potential of crop diversification towards income enhancement. Three to five

times increase in net income is possible if the farmers shift their area from foodgrain crops to horticultural crops. On an average a shift of 1 acre from foodgrains to flowers will bring an additional net income of Rs.14,002, while it will bring an additional net income of Rs.10,479 and Rs.8328 respectively in case of a shift in favour of vegetables and fruit crops. The net gain of such a shift would of course be lower in case of long duration and perennial crops like sugarcane and fruits as the farmer would not be able to take a second crop as in the case of foodgrains. Thus vegetables and flowers provide the most attractive alternative crop.

Table 8.2 : Gross Value of Output, Cost of Cultivation and Net Value of Output per Acre for Crop Groups on Sample Farms (Rs.)

Crop Group	Gross Value of Output	Cost of Cultivation	Net Value of Output	Output-Input Ratio
Foodgrains	5280	1978	3302	2.67
Sugarcane	15304	4886	10418	3.13
Oilseeds	7330	2109	5221	3.48
Vegetables	19688	5907	13781	3.33
Flowers	25297	7993	17304	3.16
Fruits	18875	7245	11630	2.61
Spices	6640	2011	4629	3.30
All Crops	12038	4153	7885	2.88

Table 8.3 : Crop-wise Gross Value of Output, Cost of Cultivation and Net Value of Output per Acre on Sampl Farms (Rs.)

Crop Group	Gross Value of Output	Cost of Cultivation	Net Value of Output	Output-Input Ratio
<u>Foodgrains</u>				
Rice	5269	2042	3227	2.58
Wheat	5352	2187	3165	2.45
Maize	4164	1456	2708	2.86
Coarse Cereals	8704	1321	7383	6.59
Pulses	6597	1397	5200	4.72
<u>Oilseeds</u>				
Groundnut	10145	1901	8244	5.34
Mustard	8282	2454	5828	3.37
Soyabean	3778	1808	1970	2.09
<u>Vegetables</u>				
Potato	23039	8405	14634	2.74
Onions	16776	4706	12070	3.56
Tomato	24270	6991	17279	3.47
Lady's Finger	12483	2562	9921	4.87
Brinjal	9926	3013	6913	3.29
Peas	11652	3364	8288	3.46
Cauliflower	19627	4994	14633	3.93
<u>Flowers</u>				
Bela	45996	14243	31753	3.23
Marigold	18750	6140	12610	3.05
Rose	35037	6682	28355	5.24
Gladiolus	16597	5893	10704	2.82
<u>Fruits</u>				
Guava	11634	3012	8622	3.86
Mango	29599	6389	23210	4.63
Apple	22470	9824	12646	2.29
Peach	25566	12276	13290	2.08
Plum	19252	9704	9548	1.98
Apricot	26886	11655	15231	2.31
Lemon	14087	5712	8375	2.47

Gross and net value of output for individual crops on the sample farms have been shown in Table 8.3. Among cereals net value of output is clearly higher for coarse cereals and pulses as compared to wheat and rice. Among oilseeds net income is higher for groundnut followed by mustard. Among vegetables tomato is the most profitable crop followed by potato and onions. The net returns on these crops are clearly higher than the net return on green vegetables.

Bela and rose cultivation yields the highest return among all the crops. Net returns for marigold and gladiolus were found to be much lower than for bela and rose. Among fruit crops net returns per acre are distinctly higher for mango and lowest for guava and lemon with apples etc. falling in the middle level. On the whole, one finds that net returns per acre are distinctly higher on all non-foodgrain crops as compared to the food crops even though net returns vary quite sharply among non-foodgrain crops. In terms of net returns per acre the most profitable crop is bela followed by rose, mango, tomato, apricot and potato in that order.

9.0 EMPLOYMENT IMPLICATIONS OF DIVERSIFICATION

9.1 Labour Use Per Acre : Crop diversification is considered desirable not only for its income enhancement effects but also its employment enhancement effects as

horticultural crops in general are more labour intensive. This is corroborated by our field study also. For instance, per acre labour use on the sample farms came to 126, 121 and 118 mandays for flowers, vegetables and fruits against only 42 mandays for foodgrains (Table 9.1). Thus, labour intensity is nearly three times more for horticultural crops as compared to foodgrain crops. In general labour use per acre was found to be relatively higher for most crops in Jaunpur district, which is a labour surplus region. For fruit crops, however, labour use per acre was distinctly higher in Nainital district, which specializes in growing fruit crops like apples, peaches, apricots and plums.

Table 9.1 : Labour Use Per Acre on Sample Farms (in Mandays)

Crops	Jaunpur	Jhansi	Nainital	Total
Foodgrains	48	40	41	42
Sugarcane	85	48	42	49
Oilseeds	40	47	42	45
Vegetables	161	139	88	121
Flowers	233	132	78	126
Fruits	83	106	140	118
Spices	-	65	27	51
All Crops	87	77	71	76

Table 9.2 : Crop-wise Labour Use (Family & Hired) per Acre on Sample Farms

Crops	Labour Use per Acre in Mandays			
	Male	Female	Child	Total
<u>Foodgrains</u>				
Rice	28.0	15.0	2.5	45.5
Wheat	24.0	12.0	3.0	39.0
Maize	27.0	13.5	3.5	44.0
Coarse Cereals	21.0	7.5	2.0	30.5
Pulses	26.0	12.8	2.5	41.3
<u>Oilseeds</u>				
Groundnut	26.0	15.8	4.0	45.8
Mustard	30.0	18.0	5.5	53.5
Soyabean	21.0	12.0	2.0	35.0
<u>Vegetables</u>				
Potato	77.0	49.5	16.0	142.5
Onions	80.0	65.3	29.0	174.3
Tomato	59.0	35.3	11.5	105.8
Lady Finger	55.0	45.0	18.5	118.5
Brinjal	67.0	9.8	15.0	91.8
Peas	39.0	30.8	12.5	82.3
Cauliflower	75.0	50.3	17.0	142.3
<u>Flowers</u>				
Bela	104.0	56.3	15.0	175.3
Marigold	73.0	53.3	18.0	144.3
Rose	75.0	59.3	13.0	147.3
Gladiolus	36.0	29.4	11.5	76.9
<u>Fruits</u>				
Guava	49.0	22.5	8.5	80.0
Mango	50.0	33.0	16.5	99.5
Apple	91.0	36.0	8.0	135.0
Peach	107.0	42.8	9.5	159.3
Plum	93.0	30.0	9.5	132.5
Apricot	93.0	36.0	9.0	138.0
Lemon	83.0	60.0	31.5	174.5

Note : Mandays have been calculated by assuming 1 manday equal to 0.75 female day and 0.50 child day.

Labour use per acre in mandays for individual crops has been shown in Table 9.2. Among foodgrains rice is the most labour intensive and coarse cereals least labour intensive crop. For oilseeds labour use is higher for mustard as compared to groundnut and soyabeans. Individual vegetable crops show large variation in labour use per acre. Onions and potato are more labour intensive crops as compared to green vegetables. Labour requirement for flower crops are much higher than for most other crops, except for gladiolus. Among fruits labour requirements are highest for lemon followed by temperate fruits like apple, peach, etc. Labour requirements for mango and guava are of a much lower order.

9.2 Use of Female and Child Labour : We have also examined the contribution of female and child labour to total employment on the sample farms. For purposes of comparison adult female day is assumed to be equal to 0.75 manday, while child day has been assumed equal to 0.50 manday. Male labour accounted for 57.9 per cent of labour use while female labour accounted for 33.6 per cent and child labour for 8.6 per cent of labour use on the sample farms (Table 9.3).

The use of female labour and child labour is found to be relatively higher for non-foodgrain crops as compared to foodgrain crops specially so in the case of vegetables and flowers. This is explained by the greater need of labour and light nature of work on these crops. Thus, crop diversification in favour of non-foodgrain crops will also have a favourable impact on female employment.

Table 9.3 : Per Acre Male, Female and Child Labour Use on Sample Farms (In Man-days)

Crops	Adult Male	Adult Female	Child	Total
Foodgrains	26.0(63.0)	12.8(31.0)	2.5(6.1)	41.3(100.0)
Sugarcane	33.0(68.0)	10.5(21.6)	5.0(10.3)	48.5(100.0)
Oilseeds	26.0(57.7)	15.0(33.3)	4.0(8.9)	45.0(100.0)
Vegetables	64.0(52.9)	42.0(34.7)	15.0(12.4)	121.0(100.0)
Flowers	67.0(53.4)	45.0(35.9)	13.5(10.8)	125.5(100.0)
Fruits	71.0(60.3)	38.3(32.5)	8.5(7.2)	117.8(100.0)
Spices	31.0(61.6)	15.8(31.4)	3.5(7.0)	50.3(100.0)
All Crops	44.0(57.9)	25.5(33.6)	6.5(8.6)	76.0(100.0)

Note : 1. Female labour day has been assumed equal to 0.75 of adult man-day and child labour day equal to 0.50 adult manday.

2. Figures in brackets show percentage to total mandays

9.3 Use of Hired Labour : Two thirds of farm employment was provided by family labour and one-third by hired labour. The proportion of hired labour to total labour use was found to be relatively higher in Nanital (42.3 per cent) as compared to Jaunpur (27.6 per cent) and Jhansi (23.4 per cent). Hired labour days accounted for 36.4 per cent of total labour days for males, 29.4 per cent for females and 23.0 per cent for children.

Looking at the crop-wise use of hired labour we find that reliance on hired labour is much more for sugarcane (68.0 per cent) and fruits (39.7 per cent) as compared to other crops (Table 9.4). Hired labour accounts for 32.1 per cent of labour use in foodgrain cultivation, whereas this proportion is 25.2 per cent for vegetables and 26.4 per cent for flowers.

It would look that higher labour requiremen for horticultural crops notably vegetables and flowers is met by greater reliance on family labour. Thus it would have a favourable impact as far as reduction in underemployment in agriculture is concerned. This would also raise the demand for hired labour in absolute terms thus favourably affecting agricultural labourers.

Table 9.4 : Family and Hired Labour Use on Sample Farms
(Mandays Per Acre)

Crops	Family Labour	Hired Labour	Total Labour
Foodgrains	28.0(67.9)	13.3(32.1)	41.3(100.0)
Sugarcane	15.5(32.0)	33.0(68.0)	48.5(100.0)
Oilseeds	31.0(68.9)	14.0(31.3)	45.0(100.0)
Vegetables	90.5(74.8)	30.5(25.2)	121.0(100.0)
Flowers	92.7(73.9)	32.8(26.1)	125.5(100.0)
Fruits	71.0(60.3)	46.8(39.7)	117.8(100.0)
Spices	44.5(88.5)	5.8(11.5)	50.3(100.0)
All Crops	51.0(67.1)	25.0(32.9)	76.0(100.0)

10.0 MARKETING OF PRODUCE

10.1 Market Orientation : Marketing of produce assumes special importance in the context of crop diversification. 55.0 per cent of the sample farmers reported that they were mainly market oriented and 42.8 per cent of farmers reported mixed orientation, that is, production for sale as well as self-consumption. Only 2.2 per cent of the respondents reported that they were subsistence oriented (Table 10.1).

Table 10.1 : Distribution of Respondents by Market Orientation

	Jaunpur	Jhansi	Nainital	Total
Mainly Subsistence Oriented	3(5.0)	1(1.67)	—	4(2.22)
Mainly Market Oriented	33(55.0)	33(55.00)	33(55.00)	99(55.00)
Mixed	24(40.0)	26(43.33)	27(45.00)	77(42.78)
Total	60(100.0)	60(100.0)	60(100.0)	180(100.0)

Differences in the market orientation could be observed for individual crops (Table 10.2). Production of foodgrains is oriented to the market to a relatively lesser extent. Thus, around 60 per cent of farmers growing wheat and coarse cereals reported sale of output. In case of pulse growers this proportion was as low as 37.5 per cent.

Table 10.2 : Crop-wise Per Cent Sample Farmers Reporting Sale of Output and Per Cent of Output Sold

Crops	Per Cent of Farmers Reporting Sale of Output	Per Cent of Output Sold
<u>Foodgrains</u>		
Rice	75.00	62.43
Wheat	58.68	51.10
Maize	65.71	52.83
Coarse Cereals	61.54	55.22
Pulses	37.50	36.67
<u>Oilseeds</u>		
Groundnut	100.00	81.06
Mustard	40.00	49.48
Soyabean	90.32	75.31
<u>Vegetables</u>		
Potato	87.50	73.15
Onions	95.24	76.27
Tomato	98.81	90.42
Lady Finger	97.30	84.38
Brinjal	97.30	89.14
Peas	81.48	76.83
Cauliflower	100.00	94.69
<u>Flowers</u>		
Bela	100.00	100.00
Marigold	100.00	100.00
Rose	100.00	100.00
Gladiolus	100.00	100.00
<u>Fruits</u>		
Guava	97.87	91.28
Mango	73.53	87.96
Apple	100.00	92.99
Peach	100.00	93.06
Plum	100.00	93.71
Apricot	100.00	92.25
Lemon	92.31	80.56

In case of oilseeds, groundnut and soyabean were mainly produced for market but mustard was grown mainly for self-consumption.

Horticultural crops, as would be expected, were dominated by market considerations. However, around 26 per cent of mango growers did not report any sale of produce. A very small proportion of farmers grow vegetables only for self-consumption.

10.2 Marketed Surplus : Looking at the disposal of the produce we find that for most of the cereal crops nearly half of the output is retained for self-consumption by the farmers. This proportion goes upto two-thirds for pulses (Table 10.2). Around half of mustard output is sold in the market. In case of vegetables we find that around one-fourth of output of potato and onion is retained by the farmers, while this proportion is around 10 per cent for most of the green vegetables. In case of fruits also nearly 90 per cent is sold in the market and around 10 per cent retained by the producer. The production of flowers, however, is wholly for the market.

Per household annual consumption of fruit was reported at 345 kgs. and that of vegetables at 588 kgs. This comes to 53 kgs. and 90 kgs. respectively on per capita basis. Only 7.8 per cent of vegetables and 20.2 per cent of fruits consumed by respondent households were purchased from the market. The balance supply was home produced.

Table 10.3 : Consumption of Fruits and Vegetables Per Household

	Jaunpur	Jhansi	Nainital	Total
<u>Fruits</u>				
Home Produced (in Kg.)	186	295	471	318
Purchased (in Kg.)	41	42	—	27
Total (in Kg.)	227	337	471	345
<u>Vegetables</u>				
Home Produced (in Kg.)	573	577	256	469
Purchased (in Kg.)	66	171	121	119
Total (in Kg.)	639	748	377	588

10.3 Marketing Channels : The question of linkage of the farmer with the middlemen was also probed by us. In Nainital district 40 per cent of the farmers reported such a linkage. The linkage consisted of money advance tied to agreement for sale of produce. Such linkages were specially prevalent in case of fruit production and on a limited scale for vegetable and flower production. However, in the two plain districts of Jaunpur and Jhansi such linkages were not found to exist.

Among the channels of marketing which exist in the study region the most important are the wholesale dealers (Table

Table 10.4 : Per Cent Distribution of Respondents by Agency to Which Output Was Sold

Crops	Village Traders	Money Lenders	Consumers	Whole salers	Co-op. society	Total
<u>Foodgrains</u>						
Rice	29.17	2.08	8.33	60.42	-	100.00
Wheat	28.17	5.63	9.86	56.34	-	100.00
Maize	21.74	8.70	21.74	47.82	-	100.00
Coarse Cereals	50.00	-	-	50.00	-	100.00
Pulses	40.00	6.67	20.00	33.33	-	100.00
<u>Oilseeds</u>						
Groundnut	36.36	4.55	27.27	31.82	-	100.00
Mustard	18.75	-	18.75	62.50	-	100.00
Soyabean	14.29	17.86	3.57	64.28	-	100.00
<u>Vegetables</u>						
Potato	17.86	-	11.90	70.24	-	100.00
Onions	-	2.50	22.50	75.00	-	100.00
Tomato	9.64	-	10.84	75.90	3.62	100.00
Lady's Finger	13.89	-	25.00	61.11	-	100.00
Brinjal	19.44	-	16.67	63.89	-	100.00
Peas	9.09	4.55	-	86.36	-	100.00
Cauliflower	-	-	10.00	90.00	-	100.00
<u>Flowers</u>						
Bela	23.81	-	9.52	66.67	-	100.00
Marigold	22.22	-	22.22	55.56	-	100.00
Rose	8.70	-	43.48	47.82	-	100.00
Gladiolus	4.55	4.55	9.09	72.72	9.09	100.00
<u>Fruits</u>						
Guava	30.44	2.17	19.56	47.83	-	100.00
Mango	8.00	-	12.00	80.00	-	100.00
Apple	-	5.56	-	94.44	-	100.00
Peach	-	-	-	100.00	-	100.00
Plum	-	-	5.56	94.44	-	100.00
Apricot	-	-	5.56	94.44	-	100.00
Lemon	-	-	16.67	83.33	-	100.00

10.4). The next important channel was that of the village trader. A varying part of produce was also sold by the farmers directly to the consumers. Money lenders accounted for a very small proportion of marketed output. The cooperative marketing system is practically non-existent in the study area.

Differences in the marketing pattern of foodgrain crops and horticultural crops were also observed. The proportion of farmers selling to wholesalers is relatively less in case of foodgrains growers as compared to growers of horticultural crops. On the other hand the proportion of farmers selling to village traders was found to be relatively greater in case of foodgrain growers.

Distribution of respondent farmers according to the distance from the point of sale of produce has been given in Table 10.5. Again we observe a clear difference in the pattern of sale of foodgrains and non-foodgrain crops. A substantial part of the produce of foodgrains is sold in the village itself. As we have observed earlier the role of village traders in foodgrain marketing is relatively greater. The relative distance from the place of marketing was found to be generally higher in case of horticultural crops specially for fruit crops. As we have discussed earlier the share of marketing and transport costs in total cost is relatively larger for the horticultural crops.

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Table 10.5 : Per Cent Distribution of Respondents by Distance From the Point of Sale of Produce

Crops	Distance from the Point of Sale					Total
	Within Village	Upto 2 Kms.	2 - 5 Kms.	5-10 Kms.	10+ Kms.	
<u>Foodgrains</u>						
Rice	37.50	-	6.25	47.92	8.33	100.00
Wheat	42.25	1.41	9.86	36.62	9.86	100.00
Maize	36.96	2.17	28.26	26.09	6.52	100.00
Coarse Cereals	50.00	-	12.50	12.50	25.00	100.00
Pulses	73.33	-	6.67	13.33	6.67	100.00
<u>Oilseeds</u>						
Groundnut	40.91	-	9.09	4.55	45.45	100.00
Mustard	31.25	-	12.50	12.50	43.75	100.00
Soyabean	32.14	-	21.43	39.29	7.14	100.00
<u>Vegetables</u>						
Potato	23.81	-	7.14	27.38	41.67	100.00
Onions	2.50	-	-	32.50	65.00	100.00
Tomato	10.84	-	15.66	33.74	39.76	100.00
Lady's Finger	16.67	-	8.33	19.44	55.56	100.00
Brinjal	22.22	-	13.89	11.11	52.78	100.00
Peas	13.63	4.55	4.55	40.91	36.36	100.00
Cauliflower	-	-	10.00	35.00	55.00	100.00
<u>Flowers</u>						
Bela	52.38	-	-	19.05	28.57	100.00
Marigold	22.22	5.56	5.56	22.22	44.44	100.00
Rose	8.70	13.04	13.04	34.78	30.44	100.00
Gladiolus	9.09	-	-	13.64	77.27	100.00
<u>Fruits</u>						
Guava	34.78	8.70	6.52	10.87	39.13	100.00
Mango	8.00	-	4.00	20.00	68.00	100.00
Apple	-	-	-	5.56	94.44	100.00
Peach	-	-	5.88	5.88	88.24	100.00
Plum	-	-	-	-	100.00	100.00
Apricot	-	-	-	5.56	94.44	100.00
Lemon	-	-	-	8.33	91.67	100.00

To sum up the marketing channels are much more developed and spatially widespread in case of foodgrains, but these are more concentrated in case of horticultural crops as the number of producers is small and scattered and the available surplus smaller.

10.4 Cost and Price Per Quintle : Operating and marketing cost per quintle and the average prices received by the farmers for different crops have been shown in Table 10.6. Cost per quintle was found to be highest for flowers followed by oilseeds and pulses. Transport and marketing costs were found to be significantly higher for fruits and flowers. Among fruits cost per quintle was much higher for temperate fruits like apple, peach, etc. than for mango and guava.

The average price received by farmers for all the crops was quite favourable giving a high margin of profit. Most favourable price - cost ratio was found in case of coarse cereals followed by rose, groundnut, lady finger, mango and pulses. The price - cost ratio was relatively less favourable for temperate fruits.

Table 10.6 : Cost of Production and Prices Received by Sample Farmers

Crops	Cost Per Quintle (Rs.)			Price Received per Qtl. (Rs.)	Ratio of price to cost
	Operating cost	Transport & marketing cost	Total cost		
<u>Foodgrains</u>					
Rice	144	6	150	391	2.61
Wheat	172	4	176	432	2.45
Maize	162	10	172	542	3.15
Coarse Cereals	187	6	193	1324	6.86
Pulses	295	5	300	1323	4.41
<u>Oilseeds</u>					
Groundnut	189	5	194	1005	5.18
Mustard	316	12	328	1110	3.38
Soyabean	429	14	443	927	2.09
<u>Vegetables</u>					
Potato	100	10	110	286	2.60
Onions	100	11	111	385	3.47
Tomato	106	35	141	478	3.39
Lady's Finger	62	20	82	397	4.84
Brinjal	61	17	78	247	3.17
Peas	156	30	186	608	3.27
Cauliflower	48	21	69	257	3.72
<u>Flowers</u>					
Bela	763	93	856	2765	3.23
Marigold	317	53	370	1131	3.06
Rose	386	56	442	2319	5.25
Gladiolus*	3.7	1.3	5	14	2.80
<u>Fruits</u>					
Guava	76	16	92	343	3.73
Mango	112	30	142	652	4.59
Apple	136	131	267	598	2.24
Peach	126	123	249	511	2.05
Plum	131	111	242	470	1.94
Apricot	125	120	245	558	2.32
Lemon	258	19	277	682	2.46

* Cost and price for gladiolus are per dozen.

11.0 CONSTRAINTS IN DIVERSIFICATION TO HORTICULTURAL CROPS

The profitability of horticultural crops vis-a-vis foodgrains is admittedly much higher. However, a number of constraints prevent the farmers to switch to horticultural crops or to bring larger area under these crops. Our respondents were asked to rank eight types of constraints in order of importance which they face in growing horticultural crops. Their responses with respect to vegetables, fruits and flowers have been shown in Tables 11.1, 11.2 and 11.3 respectively.

11.1 Constraints in Vegetable Cultivation : In case of vegetable growing the most acutely felt constraint is the insufficiency of land holding. Among other major constraints felt by vegetable growers are the problem of marketing and transportation of produce. Low price for produce was also mentioned as a problem by a good number of vegetable growers. Lack of knowledge about the crops was also reported as a constraint by some farmers. The constraint of irrigation also affected some cultivators particularly those belonging to the hill districts.

Table 11.1 : Main Constraints to Vegetable Cultivation

Constraints	No. of Farmers Reporting the Problem by Ranks								Total
	1	2	3	4	5	6	7	8	
Insufficient Land holding	55	27	10	17	-	-	-	6	115
Problem of marketing	18	21	33	28	2	5	5	3	115
Transportation of Produce	10	17	25	21	3	4	13	5	98
Low price for Produce	8	10	6	23	13	5	5	12	82
Lack of knowledge	-	1	3	4	18	8	2	3	39
Problem of loan payment	-	-	3	2	2	14	2	2	25
Godown/Cold Storage	-	-	-	-	2	-	1	1	4
Problem of Irrigation	6	4	6	12	3	1	1	-	33

11.2 Constraints in Fruit Cultivation : In case of fruit cultivation again the major constraint reported by the farmers is insufficiency of land holding. The problem of marketing emerged as the next important problem closely followed by the problem of transportation of produce. Some of the farmers also complained about the low price of produce and a small number pleaded lack of knowledge about fruit crops as a constraint.

Table 11.2 : Main Constraints to Fruit Cultivation

Constraints	No. of Farmers Reporting the Problem by Ranks								
	1	2	3	4	5	6	7	8	Total
Insufficient Land holding	26	20	11	18	3	1	3	4	86
Problem of marketing	11	20	25	23	1	1	2	1	84
Transportation of Produce	5	14	12	23	7	7	5	7	80
Low price for Produce	2	5	9	10	7	-	7	2	42
Lack of knowledge	1	-	-	2	6	9	2	1	21
Problem of loan payment	-	-	-	2	2	5	5	-	14
Godown/Cold Storage	-	-	-	-	-	-	-	-	-
Problem of Irrigation	4	2	7	2	1	-	-	-	16

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11.3 Constraints in Flower Cultivation : Insufficiency of land holdings, problem of marketing and transportation of produce again emerge as the three most important constraint in flower cultivation. A small number of farmers also complained about low price of produce and availability of water.

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To sum up, the foremost constraint before farmers in crop diversification is the small size of holding. Considerations of food security force farmers to take to growing of foodgrains, even if the financial returns are lower. Market

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network for foodgrain crops is also better developed. The other two major problems are those of marketing and transportation of produce. Specialized nature of horticultural crops and lack of knowledge about them also hamper farmers to take up these crops. Significantly, the problem of availability of credit and loan repayment was not felt as a serious constraint by most of our respondents. The problem of godown and cold storage facilities was also not felt strongly as the farmers prefer to sell their produce at the time of harvesting to receive ready money.

Table 11.3 : Main Constraints to Flower Cultivation

Constraints	No. of Farmers Reporting the Problem by Ranks								
	1	2	3	4	5	6	7	8	Total
Insufficient Land holding	33	5	3	7	-	1	-	9	58
Problem of marketing	5	19	12	18	-	1	-	3	58
Transportation of Produce	-	13	15	8	5	5	1	2	49
Low price for Produce	6	2	5	6	2	3	2	3	29
Lack of knowledge	-	1	-	4	2	-	-	1	8
Problem of loan payment	-	-	-	1	-	1	-	-	2
Godown/Cold Storage	-	-	-	-	-	-	-	-	-
Problem of Irrigation	10	3	1	3	1	-	-	-	18

12.0 SUMMARY AND CONCLUSION

12.1 Objectives of the Study : In the recent years the area and output of non-foodgrain crops like vegetables, fruits, flowers, spices, tea, coffee, etc. have sharply increased in the country due to the stimulus of domestic as well as external demand. This process of crop diversification needs to be supported and encouraged in view of its favourable impact on income and employment levels of the farmers. It is in this context that the present study was undertaken in the state of Uttar Pradesh. The specific objectives of the study included, among others, the following : (i) analysis of the trends in area, production and yields of horticultural crops in the state; (ii) estimation of the relative profitability of high value crops vis-a-vis foodgrain crops; and (iii) identification of the constraints to diversification towards high value crops.

12.2 Methodology and Study Design : The study is based on the analysis of both secondary and primary data. The state and district level trends in area and output of horticultural crops have been analysed with the help of the secondary official data. This was followed up by a field survey of 180 cultivators spread over 9 villages from 3 selected districts of the state, specializing in the cultivation of horticultural crops. The three selected districts included Nainital representing the hill region, Jaunpur representing the Gangetic plains and Jhansi representing the Central plateau.

12.3 Horticultural Development in U.P. : U.P. is a major producer of horticultural crops contributing 25 per cent of fruits and 30 per cent of vegetables production in the country. In 1994-95 area under fruits and vegetables was around 4.9 lakhs and 6.7 lakhs ha. respectively, yielding an estimated output of 39 lakhs M.T. of fruits and 97 lakhs M.T. of vegetables.

Mango is the most important fruit crop of U.P. accounting for over half of the area under fruits. Other main fruits grown in the U.P. plains are guava, banana, papaya, lemon, musk melon and water melon. A number of temperate fruits like apples, apricot, plum and litchi are also grown in the U.P. Himalayas. In 1994-95 U.P. produced 23.87 lakhs M.T. of mango, 1.56 lakhs M.T. of guava, 2.0 lakhs M.T. of apples and 0.66 lakh M.T. of citrus fruits.

A wide variety of vegetables are grown all over the state including potato, tomato, cabbage, cauliflower, pea, french beans, carrot, capsicum, lady's finger, gourd, radish, etc. In 1994-95 the estimated output of potato was 68.2 lakhs M.T. that of onions 3.2 lakhs M.T. and that of tomato 0.63 lakh M.T. About 61,000 ha. area in the state is under spices like haldi, chillies, adrak, lehsun, dhania, etc. with an estimated output of 1.06 lakhs M.T.

There has been a sharp increase in the area and output of horticultural crops in U.P. over the entire planning period, which has continued unabated in the post economic

reforms period as well. The annual rate of increase in fruit and vegetable area during the period 1990-91 to 1996-97 comes to 2.06 per cent and 2.80 per cent respectively, while annual increase in the output of these crops was 5.58 per cent and 5.85 per cent respectively. Floriculture has also picked up in the state in certain pockets. Output of flowers is estimated to have been 20 lakh pieces in 1995.

There is a good scope of increase in area under horticultural crops as still only 2.42 per cent of gross cropped area is under vegetables and 1.21 per cent of gross cropped area is under fruits in the state. The yield levels are also relatively lower in U.P. as compared to all India yield levels.

12.4 Socio-Economic Characteristics of Respondents : 57.2 per cent of our respondents belonged to the backward castes, 40.6 per cent to upper castes and 2.2 per cent to the scheduled castes. Around 39 per cent of the respondents were in the age group 15 to 45 years and another 37 per cent to the age group 45 to 60 years. Nearly 90 per cent of the respondents were literate and 70 per cent had received some formal education. Average size of household was 6.5 consisting of 3.6 male and 2.9 female members. On an average there were 3 workers per household.

78 per cent of the respondent households were living in pacca houses. Around 62 per cent of the households reported

ownership of TV sets and 26 per cent owned a scooter or motor cycle. Around one-third of the respondents owned a pump set. However, only 5 per cent respondents owned a tractor. On an average each sample household kept a milch animal.

12.5 Household Income : Total household income of the sample households was reported at Rs.57,114 giving a per capita income of Rs.8,773 indicating the income enhancing effect of crop diversification. Agricultural income per household was reported at Rs.32,440, which comes to 56.8 per cent of total household income. Animal husbandry contributed 15 per cent of household income, while around 25 per cent income was derived from business or service. Agricultural income per household went up from Rs.18,834 on holdings upto 1 acre to Rs.1,21,982 on holdings above 10 acres.

12.6 Holding Size and Cropping Pattern : The average size of our sample holdings was 2.84 acres. Nearly 65 per cent of the holdings were marginal (upto 2.5 acres) and another 22 per cent were small (between 2.5 and 5.0 acres). Nearly 90 per cent of gross sown area was irrigated on the sample farms.

The study of the cropping pattern of sample farms revealed that 45.75 per cent area was under foodgrains, 21.5 per cent under fruits, 15.9 per cent under vegetables, 8.8 per cent under oilseeds and 6.0 per cent under flowers. It was also observed that farmers with holdings upto 1 acre had

only 19.6 per cent area under foodgrains and had a more diversified cropping pattern. Area under vegetables and flowers declined with the size of holdings. However, large holdings preferred to grow fruit crops to a greater extent. Horticultural crops had a share of 43.3 per cent in cropped area but contributed 72.5 per cent of net output from agriculture.

12.7 Cost of Cultivation per Acre : Per acre cost of cultivation (operational costs) for foodgrains was found to be Rs.1978. Against this the cost of cultivation for horticultural crops was much higher being Rs.7993 for flowers, Rs.7245 for fruits and Rs.5907 for vegetables. The proportion of cost of hired labour, machinery and fertilizers was relatively higher for foodgrain crops, though absolute levels of inputs were lower. But the share of transport and marketing costs was much higher for non-foodgrain crops and amounted to 18.4 per cent, 23.8 per cent and 41.1 per cent of total operational costs for flowers, vegetables and fruits respectively.

12.8 Net Income per Acre : Net income per acre from crop production was found to be Rs.11,504. The marginal and small farmers had a clear advantage in terms of returns per acre. Net income per acre was highest for the lowest size category (Rs.17,750) and lowest for large holdings (Rs.7,684). Among crop groups net income per acre was distinctly higher for flowers (Rs.17,304), vegetables (Rs.13,781) and fruits

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(Rs.11,630) as compared to foodgrains (Rs.3,302). Among individual crops net returns per acre were highest for bela (Rs.31,753), followed by rose (Rs.28,355), mango (Rs.23,210), tomato (Rs.17,279), apricot (Rs.15,231) and potato (Rs.14,634).

Our study reveals the high potential of crop diversification for income enhancement of farmers. A three to five times increase in net income is possible if the farmers shift their area from foodgrains to horticultural crops. On an average a shift of one acre from foodgrains to flowers will bring an additional income of Rs.14,002, while a shift in favour of vegetables and fruits will bring an additional net income of Rs.10,479 and Rs.8,328 respectively.

12.9 Employment Implications of Diversification : Labour intensity of horticultural crops was also found to be much higher as compared to the foodgrain crops. Thus per acre labour use on sample farms came to 126 mandays for flowers, 121 mandays for vegetables and 118 mandays for fruits against a figure of only 42 mandays for foodgrains.

Male labour accounted for 57.9 per cent of total labour use while female labour accounted for 33.6 per cent and child labour for 8.6 per cent of labour use on sample farms. Crop diversification was also found to have a favourable impact on female employment as use of female labour was much higher for non-foodgrain crops than for foodgrain crops.

Two-thirds of farm employment was provided by family labour and one-third by hired labour. The use of both family and hired labour was found to be much higher for horticultural crops as compared to foodgrains. Thus, crop diversification would reduce underemployment of family labour, while also raising the demand for hired labour. Hence, agricultural labourers will also experience a favourable income and employment effect as a result of agricultural diversification.

12.10 Marketing of Produce : Differences in the market orientation were observed for individual crops. Nearly half of output of cereal crops and two-thirds output of pulse crops was retained for self-consumption by the farmers. However, only 10 per cent of the output of fruits and green vegetables was retained for self consumption, while the production of flowers was wholly for the market.

Generally the sample farmers were selling their output directly. However, in the district of Nainital many fruit growers had advance contract for sale of produce to the middleman tied to loans given by them.

The most important channel of marketing are the whole-sale traders followed by the village traders. Some part of the produce was also sold by the farmers directly to the consumers. The cooperative marketing system is practically non-existent in the study area.

The relative distance from the place of marketing was found higher for the horticultural produce as compared to foodgrains, a good part of which was sold in the village itself. A substantial proportion of farmers had to travel more than 10 kms. to dispose off their horticultural produce.

The average price received by the farmers was quite favourable for all crops giving a high margin of profit. The price-cost ratio was relatively less favourable for temperate fruits as compared to other horticultural crops mainly because of high cost of transport and marketing.

12.11 Constraints in Diversification to Horticultural Crops:

The profitability of horticultural crops vis-a-vis foodgrains, which dominate the present cropping pattern, is demonstrably much higher. However, a number of constraints prevent the farmers to switch to horticultural crops or to bring larger area under these crops. The foremost constraint reported by the farmers in crop diversification was the small size of holding. Considerations of food security compel farmers to take to the growing of foodgrains, even if the financial returns are lower. The other major problems reported by the sample farmers are those of marketing and transportation. The existing research and marketing infrastructure is oriented more to foodgrain crops due to considerations of national food security. Specialized nature of horticultural crops and lack of knowledge about them also hamper farmers to take up these crops.

12.12 Concluding Remarks : Our study has clearly demonstrated the benefits of agricultural diversification towards high value crops. Net returns on horticultural crops are three to five times higher than that on foodgrain crops. At the same time the labour requirement per acre is also nearly three times higher for the horticultural crops as compared to the foodgrain crops. From the point of view of equity also crop diversification will make a positive contribution as the marginal and small farmers have a decided advantage over the large farmers in growing the labour intensive horticultural crops. Crop diversification will also have a favourable impact on female as well as hired labour. Horticultural crops particularly fruits will simultaneously contribute to environmental improvement through increased tree cover and reduction in soil erosion especially in the hill region.

The state like U.P. has a decided comparative advantage in horticultural crops because of its favourable agro climatic factors suitable for growing a large variety of horticultural crops. Horticultural output has increased at a fairly encouraging rate in the recent years due to the impetus provided by growing demand for these products. This market led process is still too small to have a large impact on the agricultural economy of the state and needs to be supported through public policy in a systematic manner.

The policy package to promote the process of crop diversification should include, among other things the following :

- (a) Strengthening of the research and extension services oriented towards horticultural crops in the different agro-climatic zones of the state;
- (b) Adequate provision of improved varieties of seeds and planting material to the farmers;
- (c) Improvement in the rural infrastructure particularly in the field of storage, transport and marketing of these crops;
- (d) Reorganization of the rural credit delivery system to support the higher credit requirement of high value crops;
- (e) Encouragement to agro-processing industries in the rural areas on a widespread basis; and,
- (f) Organization of farmers on cooperative and group basis to take up production, processing and marketing of horticultural produce and other high value crops.

In this endeavour there is ample scope for cooperative action by the public and the private sectors. While in many areas like research, extension, development of rural infrastructure and organization of farmer's groups direct initiative may have to be taken by the government, public policy should aim at involving the private sector in its initiatives and should play a promotional role to encourage the private sector to come forward in a big way to exploit the potential of agricultural diversification.